CLAIMS

We claim:

1. A light homogenizing optical sheet, comprising: a. a planar sheet made of transparent material with parallel front and back surfaces, each said front and back surface including a microlens array formed thereon, said microlens array each including a plurality of microlenses each aligned and registered with a microlens on an opposite said front and back surfaces, said planar sheet having a sufficient thickness so that said microlenses on opposite said front and back surfaces are separated by a distance substantially equal to the focal length of said microlens.

2 The optical sheet as recited in Claim 1, wherein said planar sheet includes two parallel half-sheets laminated together.

3. The optical sheet as recited in Claim 1, wherein the centers of said microlenses on said front surface and said back surface are transversely aligned.

4 The optical sheet as recited in Claim 3, wherein said planar sheet includes two parallel half-sheets laminated together.

5. The optical sheet as recited in Claim 2, further including a common substrate disposed between said half-sheets.

6. The optical sheet as recited in Claim 4, further including a common substrate

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disposed between said half-sheets.

7. The optical sheet as recited in Claim 1, wherein said planar sheet is made of flexible material.

8. A light homogenizing optical sheet comprising: a non-planar sheet made of transparent material with parallel front and back surfaces, each said front and back surface including a microlens array formed thereon, said microlens array each including a plurality of microlenses each aligned and registered on the radius of curvature of said sheet.

9. A light homogenizing optical sheet comprising a planar sheet made of transparent material with parallel front and back surfaces, each said front and back surface including a microlens array formed thereon, said microlens array each including a plurality of microlenses each registered with a microlens on opposite said front and back surfaces such that exit cone angle is dependent on position across the sheet, said microlenses on opposite said front and back surfaces being separated by a distance of the sheet thickness substantially equal to the focal length of said microlens.

10. The optical sheet as recited in Claim 9, further including a second microlens array surface having non-equal pitch, as compared to the front microlens array surface pitch, such that the lenslet centers of both front and back surfaces are aligned substantially near the center of the active sheet, yet lenslet centers near the edge of the active sheet exhibit transverse offsets of up to one lenslet spacing.

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11. The optical sheet as recited in Claim 10, wherein each said microlens array surface has offset of up to one lenslet spacing at a specific location within the plane of the sheet.

12. The optical sheet as recited in Claim 9, further including a second microlens array surface having substantially equal pitch, as compared to the front microlens array surface pitch, such that the lenslet centers of both front and back surfaces are aligned with an offset of up to one lenslet spacing across the sheet.

13. The optical sheet as recited in Claim 12, wherein the centers of said lenslets on said front and back surfaces are aligned across the sheet with an offset of up to one lenslet while having non-equal pitch.

14. An illumination system comprising an array of one or more light-emitting sources at a source plane tiled in a pattern substantially similar yet having pitch equal to or greater than the tiling pattern of the microlens array structure of the optical sheet, collimating optics system having focal length f_c to collimate said sources of the source array, one optical sheet, and imaging optics system having focal length f_{01}., so as to provide uniform intensity output versus position across the illumination plane within the illuminated area.

15. The illumination system as recited in Claim 14 further including at least one subsequent optical sheet at the illumination plane and a second condensing optical system having focal length f_{02}, so as to provide uniform intensity output versus position across the illumination plane within the illuminated area as well as versus angle $\alpha_3$within the

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illuminated area.

16. The illumination system as recited in Claim 15 wherein the tiling patterns of the first LHS plane and the second LHS plane are not the same, such that a uniform top-hat intensity profile exhibiting x/y plane shape due to the tiling pattern of the LHS sheet in plane x_2 is formed at plane x_3, while the output exit cone shape emanating from plane x_3 exhibits shape due to the tiling pattern of the LHS sheet in plane x_1.

17. An illumination system comprising as recited as Claim 14, further including an array of one or more light-emitting sources located in a source plane tiled in a pattern substantially similar yet having pitch equal to or greater than the tiling pattern of the microlens array structure of the optical sheet, and one optical sheet, so as to provide uniform intensity output versus position across the illumination plane within the illuminated area.

18. An illumination system as recited in Claim 17, further including at least one subsequent optical sheet separated by a propagation distance, so as to provide uniform intensity output versus position across the illumination plane within the illuminated area as well as versus angle within the illuminated area.

19. The illumination system as recited Claim 18, wherein at least one optical sheet is a tailored optical sheet such that exit cone angles are allowed to overlap substantially at an illumination plane.

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